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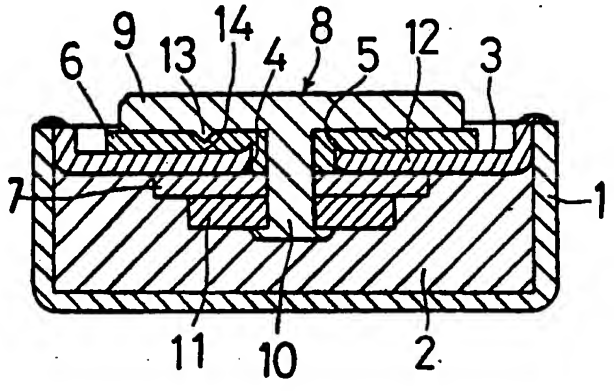
(54) **Battery seal**

(57) In a battery comprising an outer jacket can (1) including an electrode assembly (2) and serving as a terminal with one polarity, and a metal sealing cover (3) for covering said outer jacket can, a terminal pin (8) with another polarity being inserted through insulating packings (6, 7) into an aperture formed in said sealing cover, said sealing cover and said packings being held between a metal washer (11) put in a projected portion (10) of said terminal pin and a flange (9) of said terminal pin, said battery comprising at least one ring-shaped projection (13) cutting into said insulating packings, said projection being provided at said sealing cover, said flange of said terminal pin, and/or said metal washer, and thus having excellent sealing property.

FIG.3



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG.1

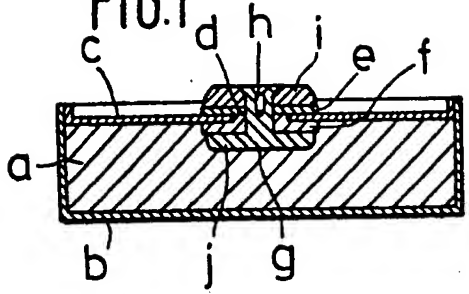


FIG.2

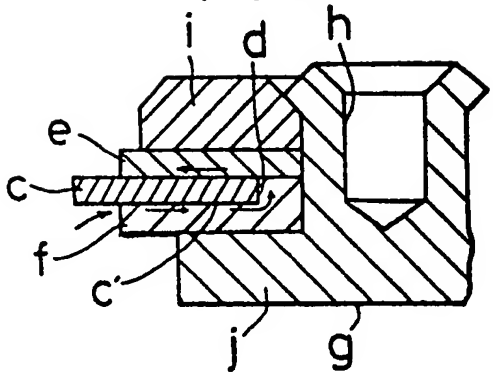


FIG.3

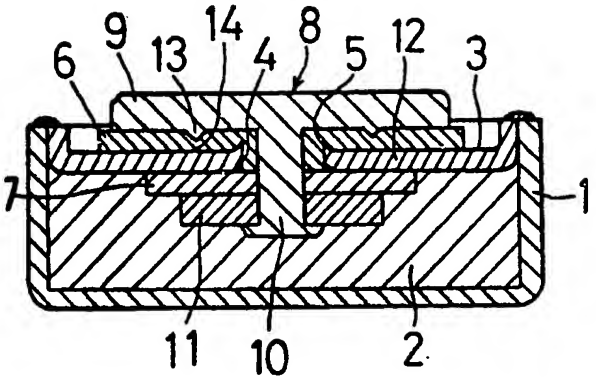


FIG.4

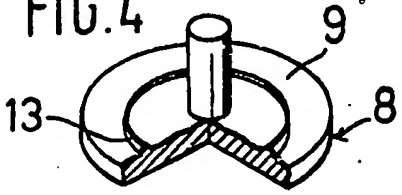


FIG.5

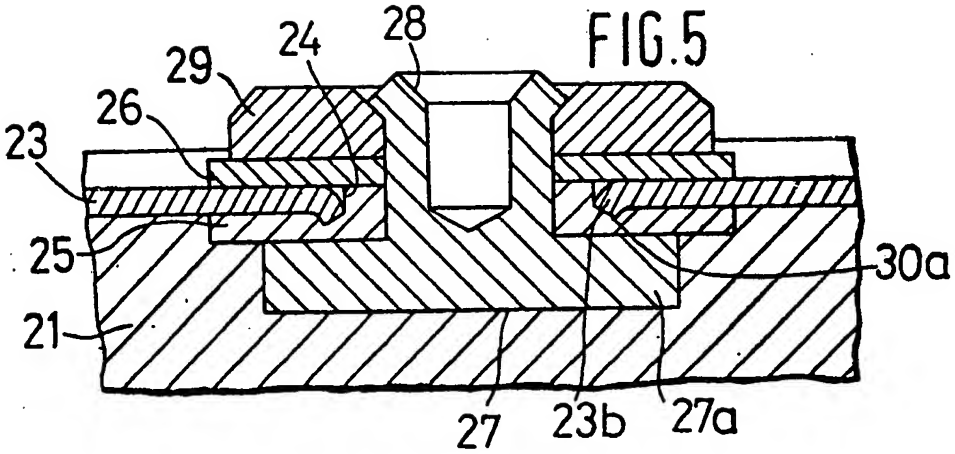


FIG.6

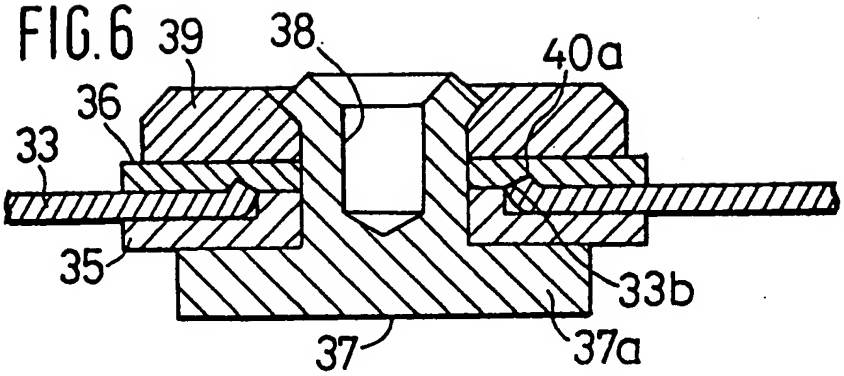


FIG.7

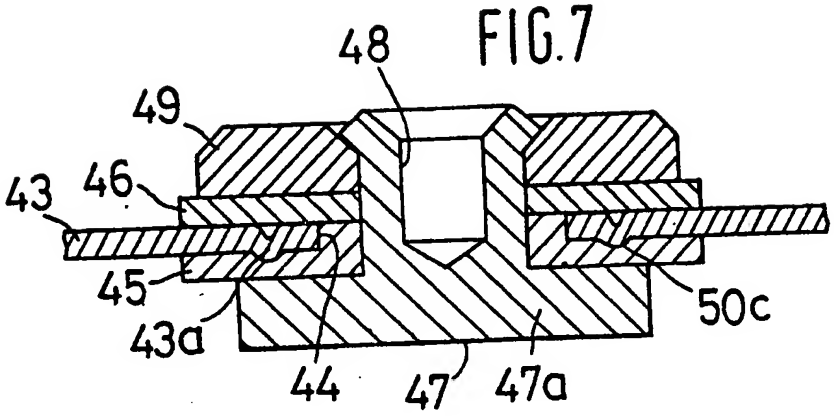


FIG.8

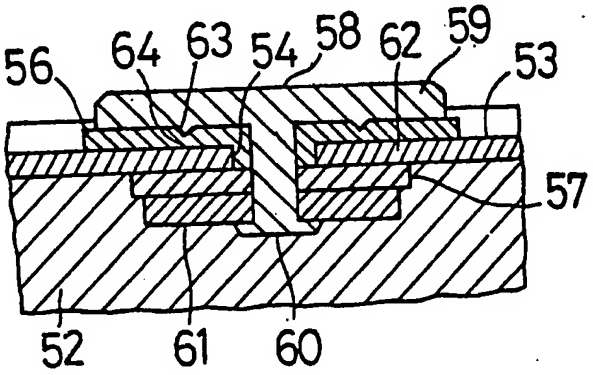
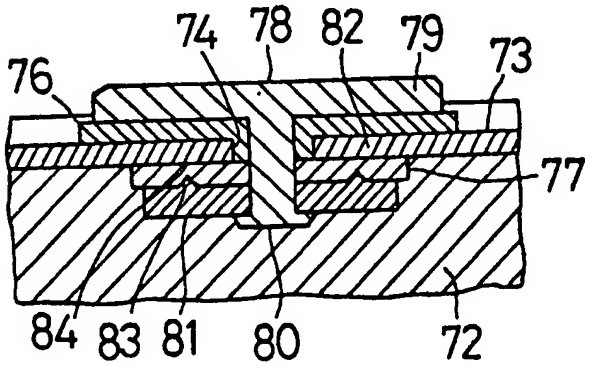


FIG.9



SPECIFICATION
Battery

This invention relates to a battery with a sealed structure having a high sealing performance.

A conventional sealed battery comprises an outer jacket can (b) serving as a terminal with one polarity and including an electrode assembly (a), and a metal sealing cover (c), as shown in Fig. 1, and the sealed battery is provided with a sealed structure which is provided by inserting a terminal pin (g) with another polarity into an aperture (d) of the cover (c) through insulating packings (e) and (f), and enlarging and crimping a top of an outside projection (h) of the terminal pin (g) between a metal washer (i) put in the outside projection (h) and an inside flange (j) of the terminal pin (g), thereby attaching the sealing cover (c) and insulating packings (e) and (f) therebetween.

In such a sealed structure, however, a portion (c') near the aperture (d) of the sealing cover (c) is flat to make a plane contact with respective insulating packings (e) and (f). Therefore, even if the crimping force for the terminal pin (g) is increased, it may be dispersed at the flat surface of the portion (c'), whereby an electrolyte within the electrode assembly may leak out as shown by arrows in Fig. 2.

The present invention is accomplished in view of such a problem, and provides particularly a sealed battery having a sealed structure with high sealing performance and preventing unwanted leakage of an electrolyte.

The present invention relates to a battery which comprises an outer jacket can serving as a terminal with one polarity and including the electrode assembly, and a metal sealing cover for the can, and which is provided with means for attaching the sealing cover and insulating packings between a metal washer put in a projected portion of a terminal pin and a flange of the terminal pin by inserting another polarity terminal pin into an aperture of the sealing cover through the insulating packings. According to the present invention, there is provided a battery wherein at least one ring-shaped projection biting into the insulating packings are produced at the sealing cover, the flange of the terminal pin, and/or the metal washer.

The battery according to the present invention is characterized in that a ring-shaped projection with a simple structure is provided at at least one portion of three members described above to bite into the insulating packings. At a result, ince the crimping force is not dispersed into the entire contact surface between the sealing cover and the insulating packings and is centered at the ring-shaped projection, the sealing performance will be greatly improved to prevent the leakage of the electrolyte.

Particularly, the sealed batteries have been used by incorporating them into electrical appliances. According to the present invention, however, by the prevention of the leakage of electrolyte, the life of the batteries will be made long, and unwanted contact fault between the batteries and contacts of the electrical appliance, the corrosion of the electrical appliances and the lowering of function of electrical appliances will be also prevented.

Fig. 1 is a cross-sectional view of a known sealed battery; Fig. 2 is an enlarged cross-sectional view of a sealed portion; Fig. 3 is a cross-sectional view of one embodiment of the present invention wherein a ring-shaped projection is provided at both a flange of another polarity terminal pin and an aperture edge of a metal sealing cover; Fig. 4 is a partially broken perspective view of another polarity terminal pin observed from the lower part; Figs. 5 to 7 are cross-sectional views of sealed portions of batteries according various embodiments wherein a ring-shaped projection is provided at an aperture edge of a metal sealing cover or at a metal sealing cover near an aperture; Fig. 8 is a cross-sectional view of a sealed portion of a battery according to further embodiment wherein a ring-shaped projection is provided at a flange of another polarity terminal pin; and Fig. 9 is a cross-sectional view of a sealed portion of a battery according to more further embodiment wherein a ring-shaped projection is provided at only a metal washer.

A battery according to the present invention is characterized in that at least one ring-shaped projection is provided at a metal sealing cover, a flange of another polarity terminal pin and/or a metal washer.

This ring-shaped projection is a continuous ring-shaped projection which is provided at a surface for pressing an insulating packing if a metal sealing cover is given as an example, and its configuration is either a pointed end structure or a slightly rounded wedge-shaped structure in a cross section. Further, the height of the projection is properly selected in such a manner that the thickness is thinner than the insulating packing. In addition, the projection can be provided by simple machining and will be apparent from the following description of embodiments.

Batteries according to the present invention will now be described with accompanying drawings.

First, as a typical structure of the battery according to the present invention wherein the ring-shaped projection is provided at two portions of three members described above, one embodiment of the battery, which includes the ring-shaped projections provided at both the flange of another polarity terminal pin and the aperture edge of the metal sealing cover so as to be opposed to each other, was shown in Fig. 3, and another polarity terminal pin used for the battery was shown in Fig. 4. In these drawings, (1) is an outer jacket can serving as one polarity terminal, which includes the electrode assembly (2) and is covered with a metal sealing cover (3). In this case, an aperture edge of the can (1) and the circumferential edge of the sealing cover (3) are welded to each other by using laser welding. The sealing cover (3) has an aperture (4) at the center thereof, and the upward ring-shaped projection (5)

is provided at the aperture edge. Another polarity terminal pin (8) is inserted into the aperture (4) through upper and lower insulating packings (6) and (7). The terminal pin has a flange (9) and is inserted into the aperture (4) in such a manner that the flange is outside positioned in the embodiment. A metal washer (11) is put into a projected portion (10) of the terminal pin (8) extending downwardly from the aperture. When the top of the projected portion (10) is crimped by collapsing, insulating packings (6) and (7) arranged at upper and lower portions of an aperture circumference (12), and the aperture circumference (12) are held by the flange (9) and the metal washer (11).

In the embodiment, since a ring-shaped projection (13) is also provided at the flange (9) as shown in Fig. 4, it cuts into the insulating packing (6) during crimping. Therefore, a part (14) of the insulating packing (6) opposing to the ring-shaped projection (13) is strongly pressed to the sealing cover (3) as compared with another portion, thereby preventing the liquid leakage from the electrode assembly (2) at the portion (14). Since the ring-shaped projections (13) and (5) cut into the insulating packing (6), the liquid leakage is prevented at two portions given by the ring-shaped projection (5) and the portion (14), thereby greatly improving the sealing performance. Further, a terminal pin which is provided with the flange at the lower portion as shown in Figs. 1 and 2 may be used instead of the terminal pin (8).

More further, the ring-shaped projections (5) and (13) are provided at both the metal sealing cover (3) and the flange of another polarity terminal pin (8) in the embodiment described above, but they may be oppositely provided at both the metal sealing cover (3) and the metal washer (11), or at both the flange of another polarity terminal pin (8) and the metal washer (11).

The insulating packings (6) and (7) are made of polyethylene, polypropylene, polyimide, silicone resin, fluorine resin, and the like which have the liquid leakage resistance for an electrolyte and the elastic property. The physical properties such as the elasticity, the hardness, and the like may be properly selected according to the batteries of the present invention. These insulating packings may be similarly employed in the following embodiments.

As batteries of the present invention wherein the ring-shaped projection is provided at one member of these three members described above, embodiments of batteries, which are provided with a ring-shaped projection formed at or near the aperture edge of the sealing cover, will be described with accompanying drawings. Fig. 5 to 7 are cross-sectional views of the sealed portions of respective embodiments.

In Fig. 5, a downward ring-shaped projection (30a) is provided at an aperture edge (23b) of a sealing cover (23) by means of swaging or pressing techniques. When an outwardly projected portion (28) of another polarity terminal pin (27) is enlarged and crimped, the ring-shaped projection (30a) cuts into a lower insulating packing (25), thereby preventing the liquid leakage of electrolyte from the electrode assembly (21) through an aperture (24).

A battery shown in Fig. 6 has a ring-shaped projection (40a) provided upwardly at an aperture edge (33b) as a structure contrary to that of Fig. 5. The ring-shaped projection (40a) cuts into the upper insulating packing (36) during crimping a terminal pin (37), thereby preventing the leakage of the electrolyte.

In a battery shown in Fig. 7 a ring-shaped projection (50c) is provided at a portion (43a) positioned near an aperture (44) of a sealing cover (43). The ring-shaped projection (50c) cuts into an insulating packing (45) during crimping a terminal pin (47), thereby preventing the leakage of the electrolyte.

The batteries according to the embodiments have advantages that the mechanical strength of the respective sealing cover (23) (33) or (43) is increased by providing the ring-shaped projection (30a) (40a) or (50c), respectively, and that the projection is provided at the sealing covers by simple machining.

Further, a plurality of ring-shaped projections may be formed at the sealing cover. The present invention may contain such a structure that two ring-shaped projections, for example, are provided at one sealing cover as shown in Figs. 6 and 7.

Next, a battery showing still another embodiment of the present invention wherein the ring-shaped projection is provided at only the flange of the terminal pin will be described with accompanying drawing. Fig. 8 is a cross-sectional view of a sealed portion according to the embodiment.

In Fig. 8, since a ring-shaped projection (63) is provided at a flange (59) of another polarity terminal pin (58), it cuts into an insulating packing (56) during crimping. Therefore, a part (64) of the insulating packing (56) opposing to the ring-shaped projection (63) is strongly pressed to a sealing cover (53) as compared with another portion, thereby preventing the leakage of the electrolyte from the electrode assembly (52) at the portion (64). In addition, the ring-shaped projection may be provided at a side contacting to an insulating packing (57) of a metal washer (61) instead of the projection described above.

Fig. 9 showed a cross-sectional view of a battery according to still further embodiment of the present invention wherein a ring-shaped projection (83) was provided at only a metal washer (81).

Further, a plurality of ring-shaped projections may be formed at the flange of another polarity terminal pin and the metal washer, respectively.

According to the present invention as described above, in detail, the ring-shaped projection is provided at at least the metal sealing cover, the flange of another polarity terminal pin, and/or the metal washer, and the sealing cover and the

insulating packings are strongly pressed to one another by cutting the projection into the insulating packings, thereby preventing the leakage of the electrolyte. Consequently, batteries with greatly high sealing performance can be provided.

CLAIMS

1. In a battery comprising an outer jacket can including an electrode assembly and serving as a terminal with one polarity, and a metal sealing cover for covering said outer jacket can, a terminal pin with another polarity being inserted through insulating packings into an aperture formed in said sealing cover, said sealing cover and said packings being held between a metal washer put in a projected portion of said terminal pin and a flange of said terminal pin, said battery comprising at least one ring-shaped projection cutting into said insulating packings, said projection being provided at said sealing cover, said flange of said terminal pin, and/or said metal washer.

2. A battery as defined in Claim 1, wherein ring-shaped projections are provided at both said flange of said terminal pin with another polarity or said metal washer and the aperture edge of said metal sealing cover or the portion positioned near said aperture edge so as to be opposed to each other.

3. A battery as defined in Claim 1, wherein said ring-shaped projection is provided at said aperture edge of said metal sealing cover or at the portion positioned near said aperture edge.

4. A battery as defined in Claim 1, wherein said ring-shaped projection is provided at said flange of said terminal pin with another polarity or at said metal washer.

5. A battery as hereinbefore described with reference to the accompanying drawings.

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